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(54) **INVERTIBLE PUNCH TOOL**

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See application file for complete search history.

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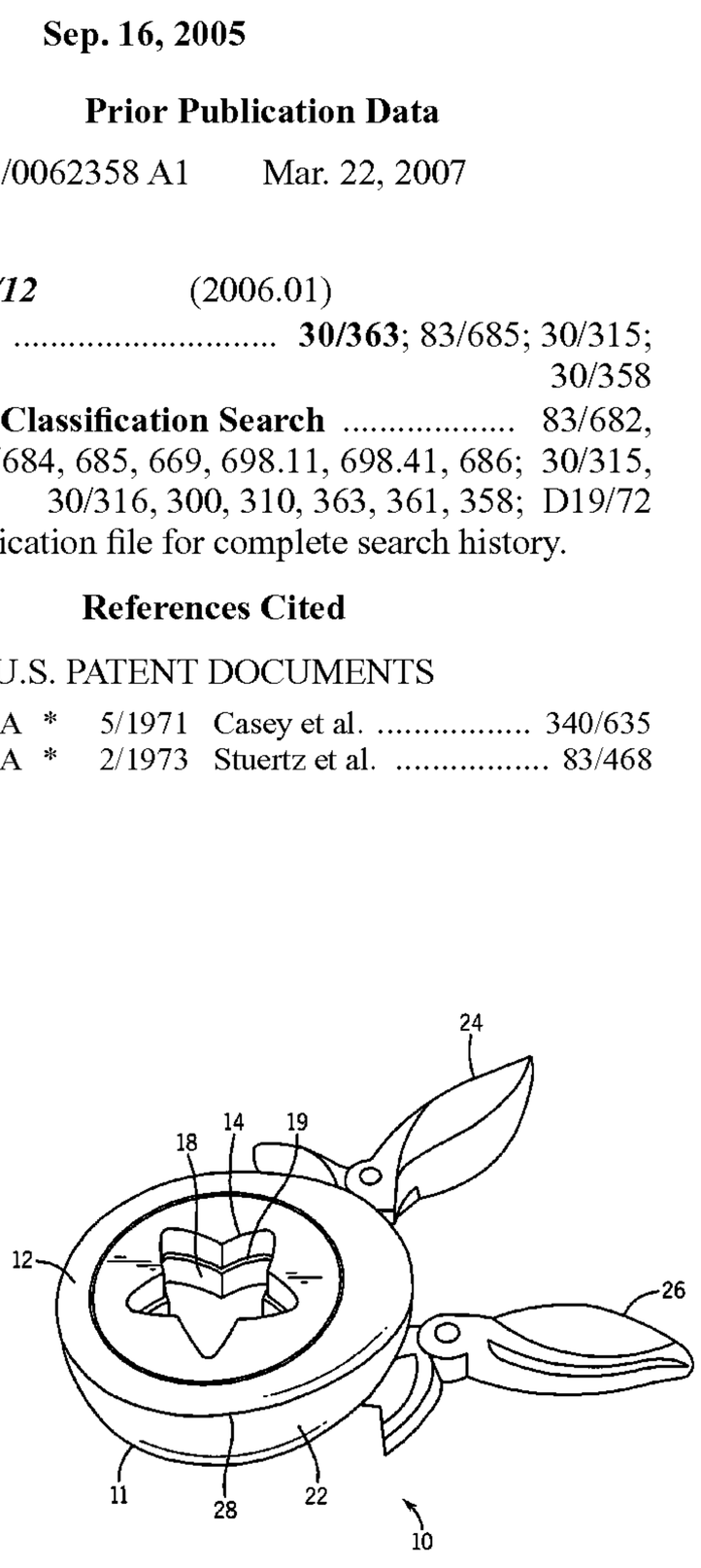
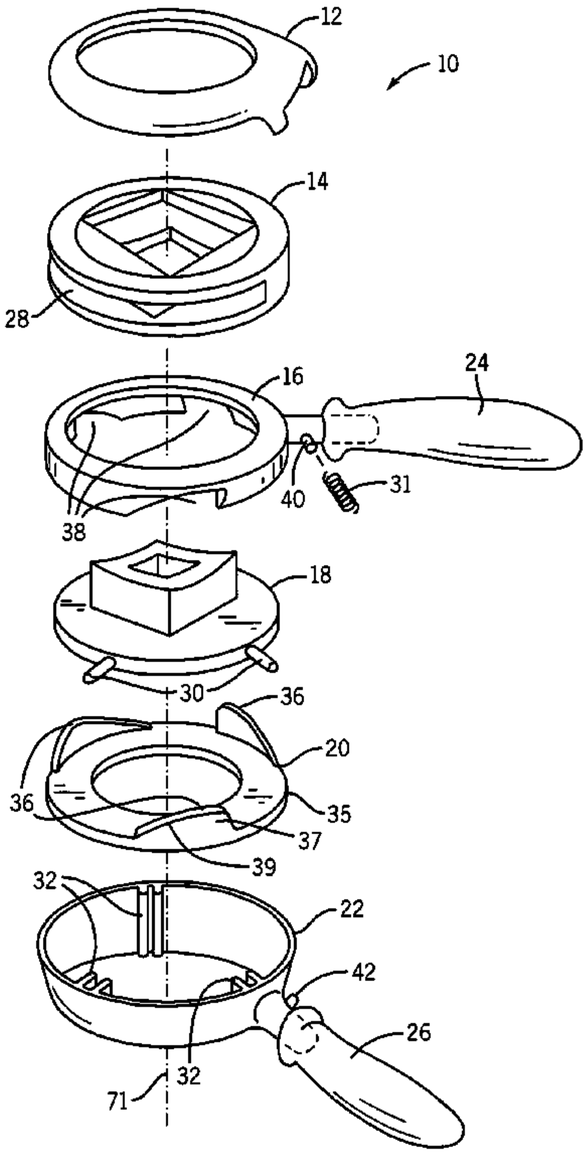
(57) **ABSTRACT**

A punch tool for the punching of a shape through a sheet of material. The punch tool includes a punch and a die portion disposed within a housing having a slot for receiving a sheet of material. A lower ramp is disposed within the housing and, when rotated, raises the punch to engage the die. The lower ramp may be rotated regardless of the orientation of the punch tool. Thus, the punch tool may be used even when in an inverted position.

**20 Claims, 3 Drawing Sheets**



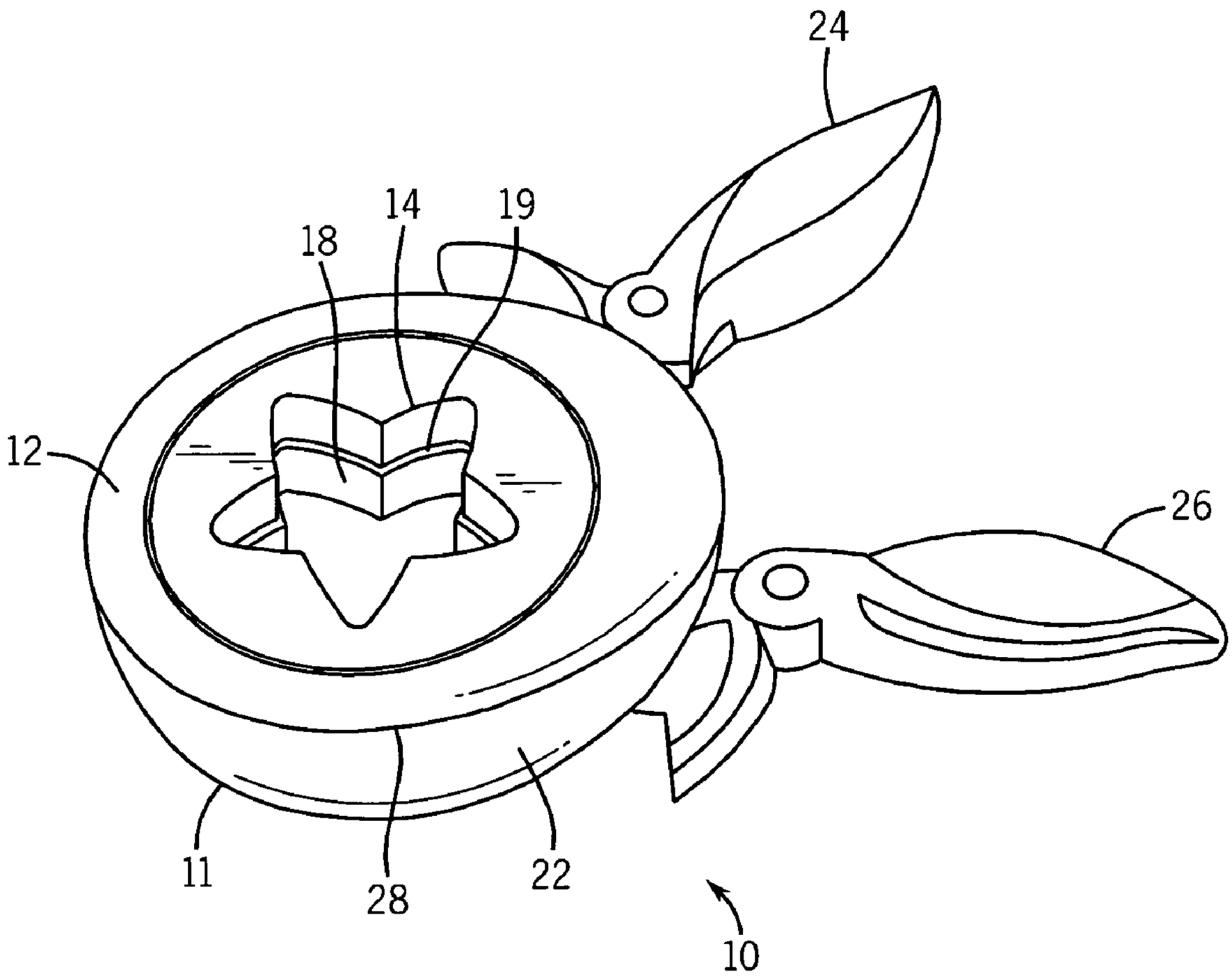
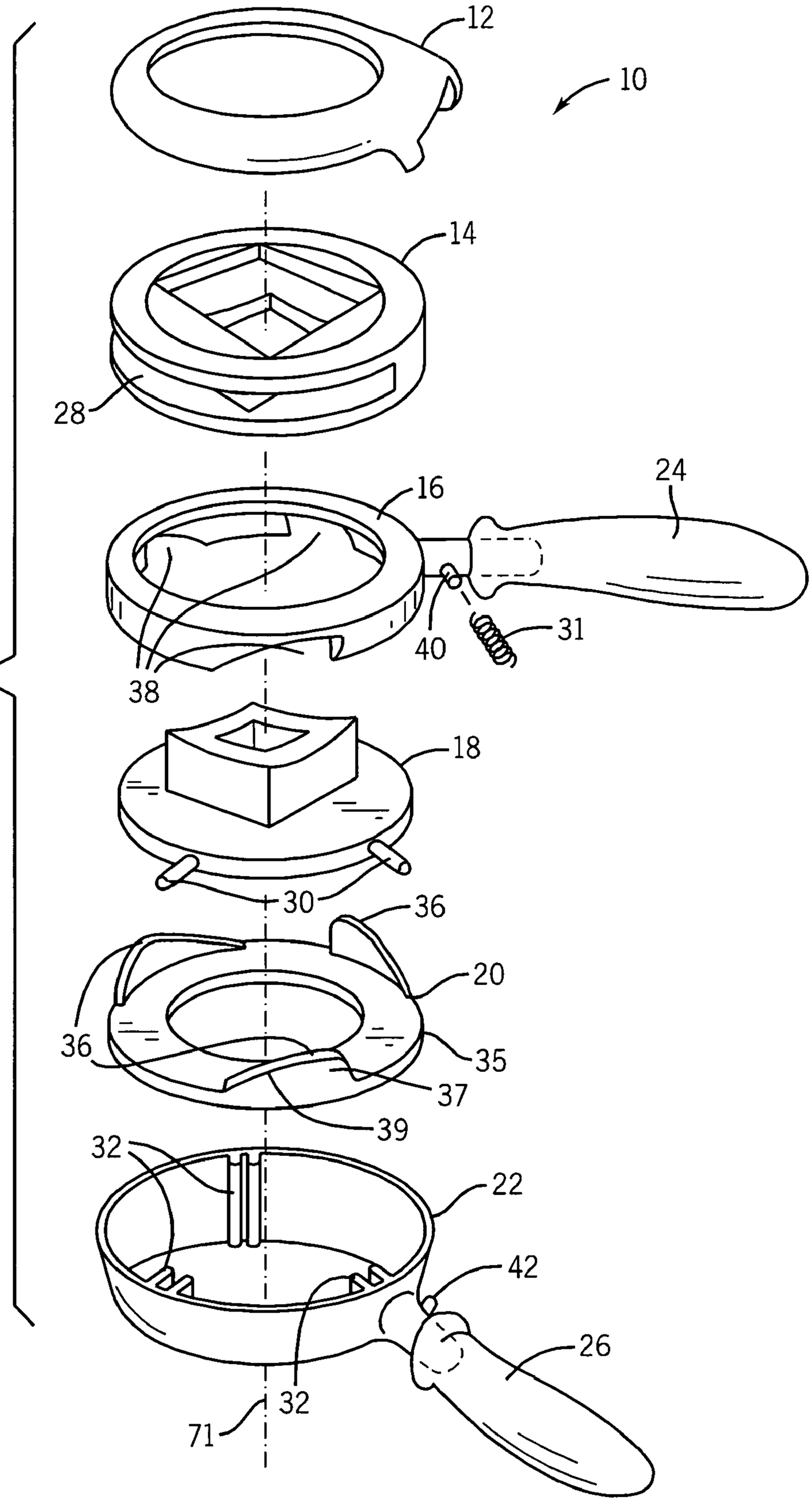



FIG. 1

FIG. 2



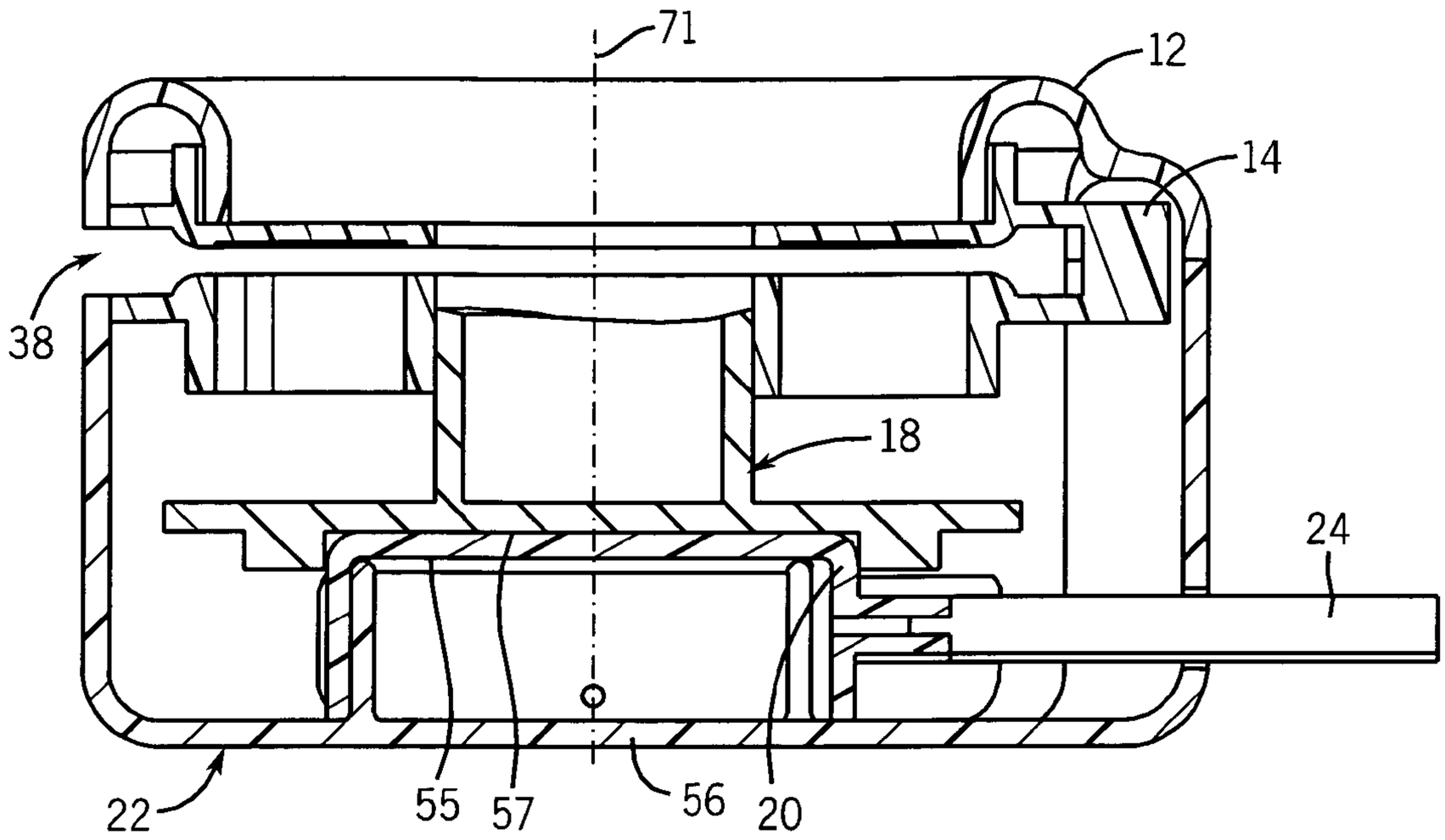



FIG. 3

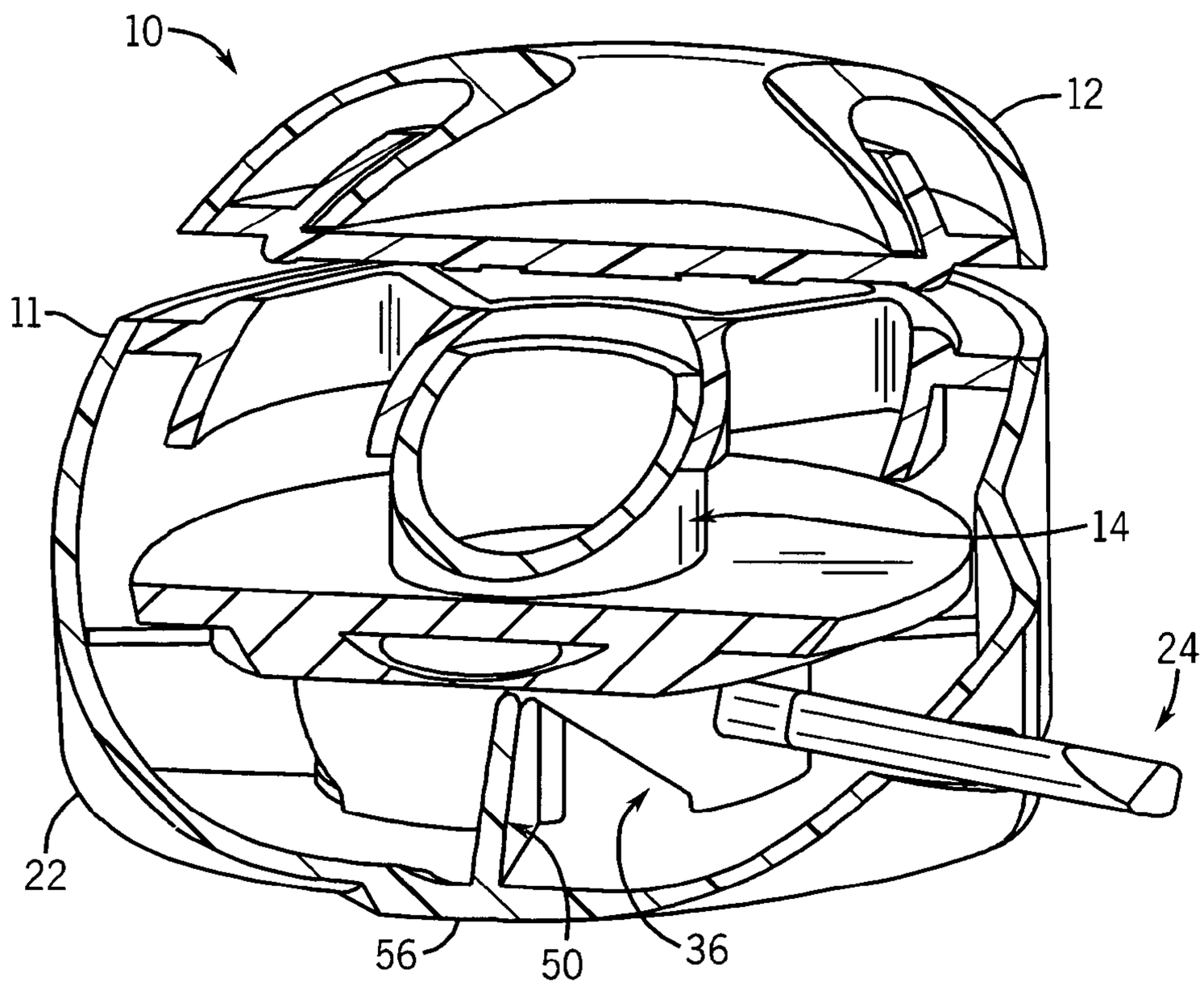



FIG. 4

# INVERTIBLE PUNCH TOOL

## TECHNICAL FIELD OF THE INVENTION

The present invention relates generally to punch devices. In particular, the present invention relates to a punch apparatus that can be used both right-side up and upside down.

## BACKGROUND OF THE INVENTION

A variety of punch tools for punching holes and designs through sheets of material are commercially available. For example, conventional triple punch tools are used to simultaneously punch three holes through sheets of material at spaces to allow for the placement of the material in a three ring binder. However, such punch tools are generally bulky and difficult to handle.

Generally, such punch tools possess a top portion which acts as an actuator to, when depressed, move a punch through a die disposed between the top portion and a base. For example, conventional punch tools often have a base designed to rest on a work surface and a top portion which is designed to pivot about an axis to depress the punch. Generally, a spring member biases the punch and the pivotable top. Unfortunately, however, the system makes actuation of the device more difficult for a user. Thus, such a punch tool is difficult to use as a handheld tool. The pivoting motion can be awkward to handle, particularly for someone with small hands, such as a child. In addition, it is often difficult to align material in the punch tool, as it is only operable in one orientation, i.e. flat on a work surface.

Some punch tools known in the art are designed as "palm punches". Generally, such punches have a small form factor, normally only including one punch. The mechanism to actuate the punch is normally a spring biased button, or the top portion is spring-biased, which the user depresses, thus pressing down on the punch and moving it through the die. However, such punches often are not amenable for use on a work surface nor easily usable with one hand due to the need to orient the punch upright prior to usage.

Currently available punches are difficult to utilize in an inverted position, i.e. when the base is located on top and the top portion is located on the bottom. Thus, there is a need for a punch tool that is capable of operating in both a normal and an inverted position and to be used while resting on a work surface for additional support.

## SUMMARY OF THE INVENTION

The present invention relates to a punch tool that is operative a plurality of orientations. The punch tool has a housing containing a punch and dye mechanism. The housing has a die portion with a cutout region adapted to receive a sheet of material. The housing has a cutout region or slot for insertion of material to be punched. The cutout region has a lower surface and an upper surface each capable of supporting a sheet of material to be punched.

These and other objects, advantages, and features of the invention, together with the organization and manner of operation thereof, will become apparent from the following detailed description when taken in conjunction with the accompanying drawings, wherein like elements have like numerals throughout the several drawings described below.

## BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a punch tool constructed according to one embodiment of the present invention;



FIG. **2** is an exploded view of a punch tool of FIG. **1**;

FIG. **3** is a cross-sectional view of a punch tool constructed according to a second embodiment of the present invention; and

FIG. **4** is a diagonal cross-sectional view of a punch tool of FIG. **3**.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention relates to a punch tool that is operable in a plurality of orientations. As illustrated in FIGS. **1-2**, the punch tool **10** includes a housing **11**. The housing **11** has a punch and die mechanism **13** which comprises a die **14** and a punch **18** in operative communication with each other. The die **14** has a cutting edge **19** with a predetermined shape. In one embodiment of the present invention, the punch and die mechanism **13** is easily removable to allow a user to select various shapes and or sizes for use in various applications. Various punch and die structures can be utilized with the present invention. The punch **18** is designed to operably engage the die **14** to cut a hole of the predetermined shape in a sheet of material (not shown). In one exemplary embodiment, more than one sheet of material may be cut at once. In one exemplary embodiment, the material to be punched is paper.

The punch tool **10** of the present invention includes a mechanism for actuating the punch **18** through the die **14** regardless of the orientation of the punch tool **10**. As shown in FIG. **2**, in one embodiment the housing **11** comprises an upper portion of the housing **12**, an upper ramp **16**, a lower ramp **20**, and a lower portion of the housing **22**. The die **14** is positioned between the upper housing **12** and the upper ramp **16**, with a slot or opening **28** in the housing **11** and die **14** to allow for insertion of the material to be punched. The punch **18** is positioned between the upper ramp **16** and the lower ramp **20**. The punch **18** and lower ramp **20** are substantially disposed between the lower housing **22** and the upper ramp **16**. In one embodiment, the lower ramp **20** and the upper ramp **16** are rotatable relative to the punch **18** and die **14** and the upper housing **12** and lower housing **22**.

In the exemplary embodiment shown in FIG. **2**, the punch **18** includes at least one peg **30** for engaging corresponding grooves **32** in the lower housing **22**. The punch **18** is rotationally fixed (about the Z-axis **71**) within the lower housing **22** but adapted to move vertically (i.e. along the Z-axis **71**) within the lower housing **22** along the grooves **32**. In one embodiment, the lower ramp **20** includes a base plate **35**, upon which the punch **18** is seated, and at least one wedge **36**. In one embodiment, the at least one wedge **36** is substantially triangular or pyramidal in shape with a base formed by the base plate **35**, an upright leg **37**, and a diagonal leg **39** therebetween. In a particular embodiment, the at least one wedge **36** includes at least three wedges spaced equidistant around the perimeter of the lower ramp **20**, and the punch **18** includes at least three corresponding pegs **30** positioned around the perimeter of the punch **18**. The at least one peg **30** engages the at least one wedge **36** and is adapted to travel along the diagonal leg **39** of the at least one wedge **36** as the at least one wedge **36** is rotated relative to the housing **11**. Thus, as the lower ramp **20** rotates, the at least one wedge **36** is rotated relative to the punch **18**, and the at least one peg **30** is raised, raising the punch **18** relative to the housing **11**. In one embodiment, the at least one peg **30** is positioned at the base of the at least one wedge **36** and moves along the diagonal leg **39** as the lower ramp **20** is rotated.

In one embodiment, the upper ramp **16** includes at least one cutout portion **38** corresponding to and adapted for engaging the at least one wedge **36** of the lower ramp **20**. While the cutout **38** may be of any shape or size capable of engaging the at least one wedge **36**, in one embodiment the at least one cutout **38** is of a corresponding shape to the at least one wedge **36** wherein the cutout **38** engages the vertical leg **37** of the at least one wedge **36**. Thus, the upper ramp **16** and lower ramp **20** are in operative communication so that rotation of the upper ramp **16** about the Z-axis **71** causes the at least one cutout portion **38** to engage the at least one wedge **36**, thus rotating the lower ramp **20** about the Z-axis **71** (shown in FIG. **2**) as well.

In the embodiment illustrated in FIGS. **3** and **4**, the punch **18** includes a mechanism for engaging the lower housing **22** to prevent rotational movement while allowing the punch **18** to engage the die **14**. In another exemplary embodiment, the housing **11** includes an upper housing **12**, a lower housing **22**, and a lower ramp **20** having a first side **54** for engaging the punch **18** and a second side **55** for engaging the lower housing **22**. The lower housing **22** includes a base **56** substantially perpendicular to the Z-axis **71**, a sidewall **58** extending substantially from the perimeter of the base **56**, and at least one rib **50**, which is a vertical protrusion extending perpendicular from the base **56** of the lower housing **22** along the Z-axis **71**. In one embodiment, the at least one rib **50** extends substantially the entire width of the base **56** of the lower housing **22** and passes through the center of the base **56**. The lower ramp **20** includes at least one wedge **36** for engaging the at least one rib **50** of the lower housing **22**. When the lower ramp **20** is rotated, the at least one wedge **36** engages the at least one rib **50**, and the lower ramp **20** and the punch **18** positioned above it are raised along the Z-axis **71** relative to the upper housing **12**, the lower housing **22**, and the die **14**.

In the embodiment shown in FIG. **1**, the housing **11** includes a first handle **24** and a second handle **26**. As shown in FIG. **2**, the first handle **24** is fixedly attached to the upper ramp **16** and the second handle **26** is fixedly attached to the lower housing **22**. As the upper ramp **16** (and lower ramp **20**) are rotatable relative to the upper housing **12**, punch and die **13**, and lower housing **22**, a mechanism for restricting the movement of the ramps is provided. In one embodiment, the upper housing **12** includes a first restriction tab **60** and a second restriction tab **61** which are positioned to engage the first handle **24** and the second handle **26** respectively. When the first handle **24** is positioned near the first restriction tab **60** and the second handle **26** is positioned near the second restriction tab **61**, the punch **18** is in the lowered positioned, i.e., the peg **30** (FIG. **1**) or rib **50** (FIG. **3**) is positioned against the base of the lower housing **22** and the punch is disengaged from the die. As the first handle **24** and second handle **26** are brought in proximity to each other, the lower ramp **20** rotates and the punch **18** is raised to engage the die **14**. In one embodiment, a biasing mechanism is used to maintain the first handle **24** and the second handle **26** in the "resting position" wherein the punch **18** is disengaged from the die **14**. In a preferred embodiment, the first handle **24** is adapted to receive a first end of a spring **31** and the second handle **26** is adapted to receive a second end of the spring **31** for biasing the handles **24**, **26**.

One of ordinary skill in the art will appreciate that various sizes and types of dies and punches can be used with the punch tool of the present invention without departing from the spirit of the invention. For example, a punch tool of the present invention may be sized to fit in the palm of a users hand or alternatively may be sized for use on a desk or other work surface.

It should be understood that various changes and modifications to the embodiment described herein would be apparent to those skilled in the art. Such changes and modifications can be made without departing from the spirit and scope of the present invention and without demising its attendant advantages.

What is claimed is:

**1**. A punch tool comprising:

a housing having a lower portion, an upper portion, and a region between the upper portion and the lower portion for receiving a material to be punched, the lower portion and the upper portion moveably positionable relative to each other;

a punch and a die both at least partially disposed in the housing;

a lower ramp positioned between the punch and the lower portion of the housing and rotatable relative thereto about an axis of rotation, the lower ramp engageable with the punch upon rotation of the lower ramp; and

an upper ramp positioned between the upper portion of the housing and the punch and rotatable relative thereto, the upper ramp engageable with the lower ramp,

wherein rotation of the upper ramp results in rotation of the lower ramp and wherein rotation of the lower ramp results in movement of the punch within the housing in a direction substantially parallel to the axis of rotation, engaging the die.

**2**. The punch tool of claim **1**, wherein the punch is rotationally fixed by engagement with the housing.

**3**. The punch tool of claim **1**, further comprising a first handle coupled to the upper ramp and a second handle affixed to the housing, the first handle and the second handle movably positioned relative to each other, wherein the drawing of the first handle nearer to the second handle rotates the upper ramp.

**4**. The punch tool of claim **3**, wherein the first handle and the second handle are movable relative to each other within a limited range sufficient to rotate the upper ramp to allow the punch to engage the die.

**5**. The punch tool of claim **4**, wherein the first handle and the second handle are biased away from each other.

**6**. A punch tool comprising:

a housing having a lower portion, an upper portion, and a region between the upper portion and the lower portion for receiving a material to be punched, the lower portion and the upper portion moveably positionable relative to each other;

a punch and a die both at least partially disposed in the housing;

a lower ramp positioned between the punch and the lower portion of the housing and rotatable relative thereto about an axis of rotation, the lower ramp engageable with the punch upon rotation of the lower ramp;

a first handle coupled to the lower ramp and a second handle affixed to the housing, the first and second handle movably positioned relative to each other, wherein drawing the first handle nearer to the second handle rotates the lower ramp,

wherein rotation of the lower ramp results in movement of the punch within the housing in a direction substantially parallel to the axis of rotation, engaging the die, and wherein the lower ramp is engageable with the lower portion of the housing and with the punch upon rotation of the lower ramp.

7. The punch tool of claim 6, wherein the first handle and the second handle are movable relative to each other within a limited range sufficient to rotate the upper ramp to allow the punch to engage the die.

8. The punch tool of claim 7, wherein the first handle and the second handle are biased apart from each other.

9. An invertible punch tool comprising:

a housing having a lower portion, an upper portion, and a region between the upper portion and the lower portion for receiving a material to be punched;

a punch rotationally fixed within the housing and a die, the punch and die at least partially disposed in the housing;

an upper ramp positioned between the upper portion of the housing and the punch and rotatable relative thereto and a lower ramp positioned between the punch and the lower portion of the housing and rotatable relative thereto; and

the upper ramp engageable with the lower ramp whereby rotation of the upper ramp rotates the lower ramp and the lower ramp engageable with the punch upon rotation of the lower ramp,

wherein rotation of the lower ramp results in movement of the punch within the housing, engaging the die.

10. The invertible punch tool of claim 9, further comprising a first handle coupled to the upper ramp and a second handle affixed to the housing, the first handle and second handle movably positioned relative to each other, wherein the drawing of the first handle nearer to the second handle rotates the upper ramp.

11. The invertible punch tool of claim 10, wherein the punch includes a plurality of protrusions and the mechanism for engaging the punch includes a plurality of wedges corresponding to the protrusions, wherein as the lower ramp rotates, the wedges engage the protrusions and raise the punch relative to the housing.

12. The invertible punch tool of claim 10, wherein the first handle and the second handle are movable relative to each other within a limited range sufficient to rotate the upper ramp to allow the punch to engage the die.

13. The invertible punch tool of claim 12, wherein the first handle and the second handle are biased away from each other.

14. An invertible punch tool comprising:

a housing having a lower portion, an upper portion, and a region between the lower portion and the upper portion for receiving a material to be punched;

a punch and a die at least partially disposed in the housing;

an upper ramp including a plurality of openings;

a lower ramp positioned between the punch and the lower portion of the housing and rotatable relative thereto about an axis of rotation, the lower ramp engageable with the punch and with the lower portion of the housing upon rotation of the lower ramp, the lower ramp including a plurality of wedges corresponding to the plurality of openings,

wherein rotation of the lower ramp results in movement of the punch within the housing in a direction substantially parallel to the axis of rotation, engaging the die, and wherein as the lower ramp rotates, the plurality of wedges engage the plurality of openings and raise the lower ramp relative to the lower portion of the housing.

15. A punch tool comprising:

a housing having a lower portion, an upper portion, and a region between the upper portion and the lower portion for receiving a material to be punched;

a punch and a die both at least partially disposed in the housing;

a lower ramp positioned between the punch and the lower portion of the housing and rotatable relative thereto, the lower ramp engageable with the punch upon rotation of the lower ramp; and

an upper ramp positioned between the upper portion of the housing and the punch and rotatable relative thereto, the upper ramp engageable with the lower ramp,

wherein rotation of the upper ramp results in rotation of the lower ramp, and wherein rotation of the lower ramp results in movement of the punch within the housing, engaging the die.

16. A punch tool comprising:

a housing having a lower portion, an upper portion, and a region between the upper portion and the lower portion for receiving a material to be punched;

a punch and a die both at least partially disposed in the housing;

a lower ramp positioned between the punch and the lower portion of the housing and rotatable relative thereto, the lower ramp engageable with the punch upon rotation of the lower ramp;

a first handle coupled to the lower ramp; and

a second handle affixed to the housing, the first and second handle movably positioned relative to each other,

wherein drawing the first handle nearer to the second handle rotates the lower ramp, wherein rotation of the lower ramp results in movement of the punch within the housing, engaging the die, and wherein the lower ramp is engageable with the lower portion of the housing and with the punch upon rotation of the lower ramp.

17. The punch tool of claim 16, wherein the first handle and the second handle are biased apart from each other.

18. An invertible punch tool comprising:

a housing having a lower portion, an upper portion, and a region between the lower portion and the upper portion for receiving a material to be punched;

a punch and a die at least partially disposed in the housing;

a lower ramp positioned between the punch and the lower portion of the housing and rotatable relative thereto, the lower ramp engageable with the punch and with the lower portion of the housing upon rotation of the lower ramp;

a first handle coupled to the lower ramp; and

a second handle affixed to the housing, the first handle and the second handle movably positioned relative to each other,

wherein the drawing of the first handle nearer to the second handle rotates the lower ramp, and wherein rotation of the lower ramp results in movement of the punch within the housing, engaging the die.

19. The invertible punch tool of claim 18, wherein the first handle and the second handle are movable relative to each other within a limited range sufficient to rotate the upper ramp to allow the punch to engage the die.

20. The invertible punch tool of claim 19, wherein the first handle and the second handle are biased away from each other.

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